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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/317,056	05/24/1999	YASUTAKA NAKASHIBA	NEYM16.133	8595

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EXAMINER

GENCO, BRIAN C

ART UNIT PAPER NUMBER

2615

DATE MAILED: 01/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/317,056

Applicant(s)

NAKASHIBA, YASUTAKA

Examiner

Brian C Genco

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 May 1999 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4 and 5.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION***Drawings***

Figures 7-11 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance. Examiner notes that applicant described these figures as conventional and therefore are prior art and should be labeled so.

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the claimed method wherein "the electric potential during the read-out step is deeper than an adjacent electric potential which is applied, during the times except said read-out step, to said photo-electric conversion units which are adjacent to those which are being read out" must be shown or the feature(s) canceled from the claim(s). No new matter should be entered. Examiner suggests that the applicant supply further timing diagrams of this method along with a cross sectional view of the disclosed circuit perpendicular to the line I-I' shown in Fig. 8.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

The drawings are objected to under 37 CFR 1.83(a) because they fail to show the operation of the first mode of the invention as described in the specification on pages 8-10. Namely, the process taking place in the first two full paragraphs of page 9. Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the

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drawing. MPEP § 608.02(d). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance. Examiner suggests that the applicant supply further timing diagrams of this method along with a cross sectional view of the disclosed circuit perpendicular to the line I-I' shown in Fig. 8. Examiner further suggests applicant submit drawings further detailing the process of raising and lowering the potential barrier, like in Fig. 2, in association with both cross sectional views of the disclosed photo-electric conversion units and the vertical charge transfer units.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 3, 7, and 11 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

With regards to claims 3, 7, and 11 examiner notes that in the specification the only two paragraphs which might pertain to the claim language of the above mentioned claims is found on page 9 on the first two full paragraphs. In these paragraphs applicant discloses electric potentials ϕ' and ϕ_{tg} wherein $\phi' > \phi_{tg}$. Applicant then discloses that ϕ_{tg} is applied to a "charge transfer electrode 106" which is adjacent to the photo-electric conversion unit 101. Applicant discloses

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that this is needed because if $\phi_{tg} > \phi'$ then “charges stored in the photo-electric conversion unit 101 flow through signal read-out portion 120 into vertical transfer unit 102” undesirably. This would lead one skilled in the art to interpret this to mean that the potential barrier between the photo-electric conversion unit and the drain needs to be deeper than the photo-electric potential between the photo-electric conversion unit and the vertical charge transfer unit so as to prevent excess charges from leaking from the photo-electric conversion unit to the vertical charge transfer unit “during times except the read-out step.”

The claim states that an electric potential, examiner is defining as ϕ' , is deeper than an adjacent electric potential, examiner is defining as ϕ_{tg} , during the read-out step, wherein ϕ_{tg} is applied photo-electric conversion units that are adjacent to the ones being read out, or in other words applied to the photo-electric conversion units that aren't being read out. Examiner thinks that applicant is trying to claim the X-Y architecture of the image sensor with this claim language, however, nowhere in the specification is there any mention of applying an electric potential to an adjacent photo-electric conversion unit.

With regards to claim 11 examiner notes that in the specification the applicant directs the description of the embodiment with the horizontal OFD structure to the image sensor with the X-Y architecture described in the specification on pages 10-12. Examiner notes that according to this embodiment there is no teaching about “the electric potential during the read-out step is deeper than an adjacent electric potential which is applied, during the times except said read-out step, to said photo-electric conversion units which are adjacent to those which are being read out.”

Claim Rejections - 35 USC § 103

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The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-4, and 9-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over (USPN 4,696,021 to Kawahara et al) in view of (Applicant's admitted prior art).

In regards to claim 1 Kawahara et al, herein Kawahara, discloses the claimed "plurality of photo-electric conversion units" (element 1 of Fig. 1A), an "electric potential barrier" controlled by element 8 of Fig. 2B as shown in Figs. 4A-G and created by element 6' of Fig. 2B, and reads out the photo-electric conversion units by grouping them "into a prescribed number of regions," namely 1 region in this case. Kawahara does not disclose "cutting off said incident light by a cut off means such as a mechanical shutter," however, as the applicants admitted prior art discloses the use of a mechanical shutter to cut off incident light before reading out the signal charges (page 3, lines 13-16) for the very well known and established reason of eliminating the continual build up of excess charge by the photo-electric conversion units. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have used applicants

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admitted use of a mechanical shutter in Kawahara's invention in order to eliminate the continual build up of excess charge by the photo-electric conversion units. As such the combined teachings of Kawahara and applicants admitted prior art as a whole teach the claimed method of driving an image sensor, namely cutting off incident light, raising up the potential barrier, and then reading out the signal charges (Figs. 4A-G; column 5, line 3 – column 6, line 47; Kawahara). Note that Kawahara raises the potential barrier controlled by gate 8 from draining off excess charges as shown in Fig. 4B to the potential shown in Fig. 4D during read-out.

In regards to claim 2 applicant admits, on the 4th page of the Information Disclosure Statement filed March 14, 2002, that “how much of an overflow barrier OFB potential barrier difference to secure is nothing more than a design matter that can suitably be determined by one skilled in the art according to the properties, etc. of the solid-stage pickup element that is used.” According to this teaching it is only a matter of design choice to increase the potential barrier difference “by a voltage greater than 0.4 V” according to “the properties, etc. of the solid-stage pickup element that is used.”

In regards to claim 3 note that Kawahara discloses that the electric potential controlled by gate 8 is “deeper than an adjacent electric potential” during the read out period (Figs. 4D-G), namely the potential supplied by gate 5 is shallower during the times except the read out period (Figs. 4A-C). Note that since all the photo-electric conversion units are being read out then all photo-electric conversion units are adjacent to the ones that are being read out and what is true for one is true for the adjacent one in the same line.

In regards to claim 4 see examiners notes on the rejection of claim 2.

In regards to claims 9-12 see examiners notes on the rejection of claims 1-4 respectively.

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Claims 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over (USPN 4,696,021 to Kawahara et al) in view of (Applicant's admitted prior art) in further view of (USPN 5,903,021 to Lee et al).

In regards to claims 5-8 see examiners notes on the rejection of claims 1-4 respectively. Note that Kawahara does not teach to have a vertical OFD. Applicant's admitted prior art does teach to have a vertical OFD, however there is not motivation to use applicant's admitted vertical OFD in Kawahara's invention. Lee et al, herein Lee, teaches that either a lateral or vertical OFD can be used where in using a vertical overflow drain uses less photodetector area and thus increases the fill factor (column 6, lines 40-56 Lee). Therefore it would have been obvious to one of ordinary skill in the art to have used a vertical OFD in Kawahara's invention instead of a lateral OFD in order to increase the fill factor.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

(USPN 5,341,220 to Juen)

(USPN 5,382,978 to Tanaka)

(USPN 6,351,284 to Watanabe et al)

(USPN 6,166,768 to Fossum et al)

(USPN 6,043,479 to Chiang)

(USPN 5,404,039 to Watanabe)

(USPN 5,978,024 to Lee)

(USPN 5,867,055 to Asaumi et al)

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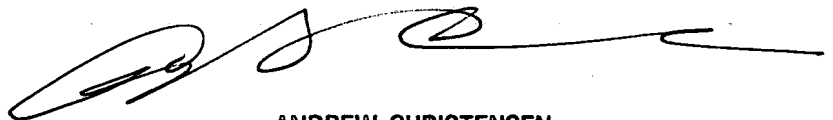
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian C. Genco who can be reached by phone at 703-305-7881 or by fax at 703-746-8325. The examiner can normally be reached on Monday thru Friday 8:00am to 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew Christensen can be reached on 703-308-9644. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9314 for regular communications and 703-872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the technology center 2600 customer service office whose telephone number is 703-306-0377.

Brian C Genco
Examiner
Art Unit 2615

January 24, 2003



ANDREW CHRISTENSEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600